

Microwave Limb Sounder: Meteorological Dataset Usage and Issues

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<http://mls.jpl.nasa.gov>



MLS Operational Meteorological Data Usage/Issues

Meteorological Datasets Downloaded Routinely:

- ☐ GMAO – GEOS-4, and soon GEOS-5 (through EOS project)
- ☐ NCEP/CPC (through EOS project)
- ☐ UK Met Office (from BADC)
- ☐ NCEP/NCAR Reanalysis (from NOAA/CDC website)

Use in production Processing:

- ☐ GEOS-4 temperatures from pressure level synoptic files used for a priori in V1.5 (and preliminary V2) level 2 (retrieval) software
- ☐ V2 operational software will use GEOS-5 time-average model level temperatures for a priori
- ☐ V2 operational software will use GEOS-5 time-average model level temperatures to calculate WMO (temperature gradient) tropopause pressure for use in column calculations

GEOS-4/GEOS-5 Issues:

- ☐ MLS V2 operational and reprocessing schedule depends on GEOS-5 rollout schedule; V2 expected to become operational at the beginning of November
- ☐ Need GEOS-4 data until (1) V2 is ready for operational forward processing, and (2) GEOS-5 is operational and up to date for use in that processing
- ☐ Working closely with GMAO to coordinate schedules; have requested and been promised test days (27-29 Jan 2005) with scientifically valid data in advance of GEOS-5 operational processing
- ☐ All tests involving routine data transfers with GMAO have gone smoothly
- ☐ Thus, no major issues except scheduling
- ☐ Further scheduling/operations discussion at DSWG meeting

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Use in regular data inspections:

- ❑ Several standard plots for stratosphere and UTLS using meteorological data from GEOS-4 (and some from Met Office) inspected and posted daily/weekly on MLS website (Knosp Poster, Session I; some examples shown in previous MPWG reports)
- ❑ Reports on stratospheric and UTLS MLS data, including relation to meteorology, given at weekly group meetings
- ❑ Following pages show examples of:
 - ⇒ MLS, GEOS-4, and GEOS-CHEM chemical transport model weekly maps at 215 hPa (from weekly UTLS MLS data/processes report, also posted on website)
 - ⇒ Equivalent/latitude-time series of MLS species involved in polar processing in lower stratosphere (from weekly stratospheric meteorology report, will be posted on new website)
 - ⇒ MLS and reverse trajectory (RT, aka RDF) maps in middle and lower stratosphere (from weekly stratospheric meteorology report)

Numerous validation/science studies; a few that may not have been highlighted elsewhere:

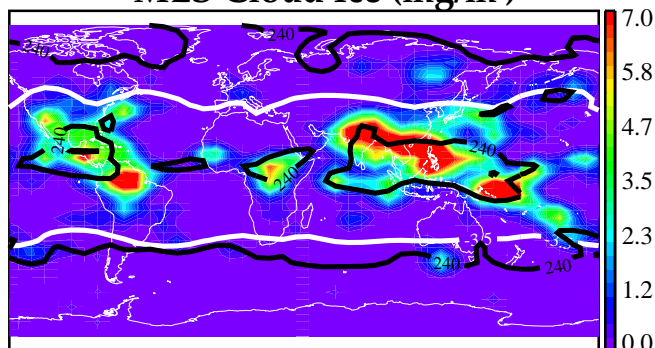
- ❑ Production/distribution of derived meteorological products (DMPs) for solar occultation datasets (Manney et al poster, Session 2)
- ❑ Use of MLS, ACE-FTS, DMPs and modeling in chlorine partitioning studies (Santee et al, paper in preparation)
- ❑ Stratospheric transport studies using MLS, SO, DMPs, including study of Jan/Feb 2006 stratospheric sudden warming (Manney et al, paper in preparation, poster, Session 2)
- ❑ Studies of stratopause structure/evolution using MLS, ACE, SABER, and GEOS-4 analyses
- ❑ Gravity wave studies using MLS, other A-Train, and high-resolution meteorological datasets
- ❑ Studies/review/overview of global STE from MLS data

MLS Upper Troposphere Weekly Mean Maps for 23-29 Jul 2006* at 215 hPa

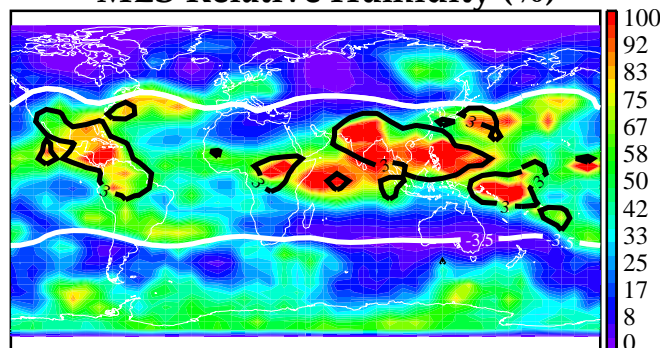
White contours: GMAO PV = 3.5 ($10^{-6}\text{Km}^2\text{kg}^{-1}\text{s}^{-1}$) indicative of dynamical tropopause

Black contours: GMAO OLR = 240 W/m^2 for IWC map and IWC = 3 mg/m^3 for other maps indicative of deep convection

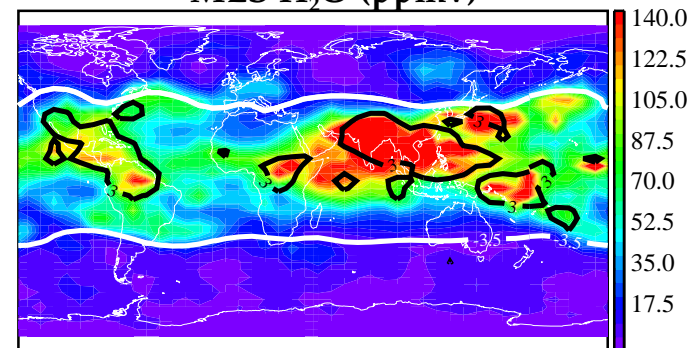
MLS Cloud Ice (mg/m^3)



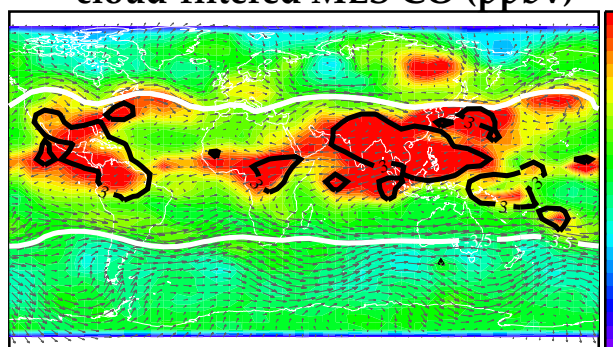
MLS Relative Humidity (%)



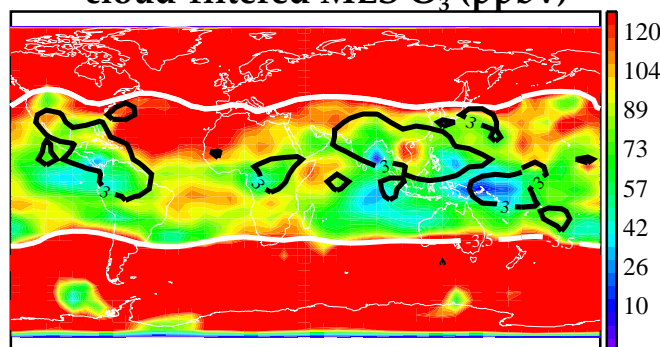
MLS H₂O (ppmv)



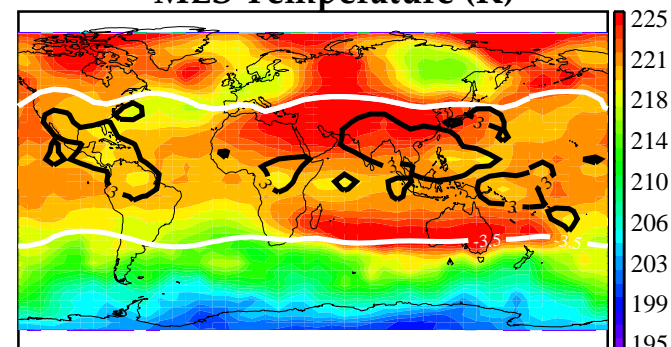
cloud-filtered MLS CO (ppbv)



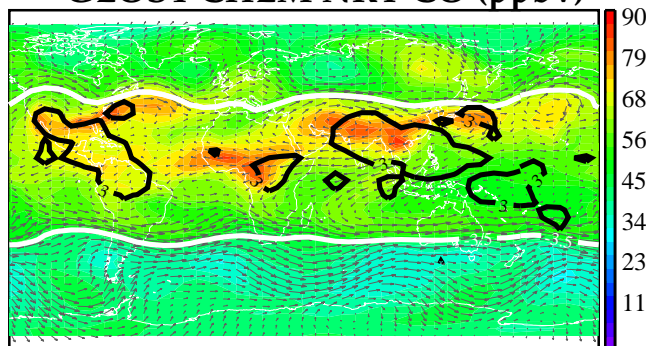
cloud-filtered MLS O₃ (ppbv)



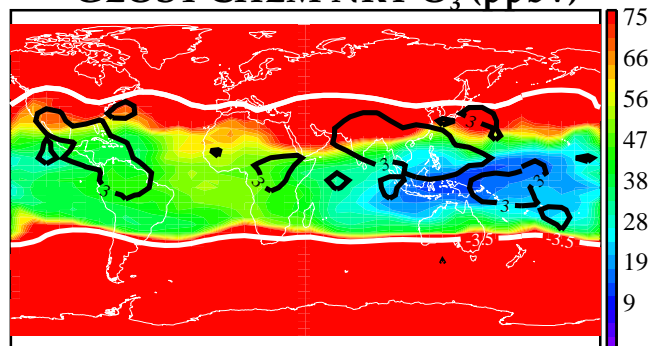
MLS Temperature (K)



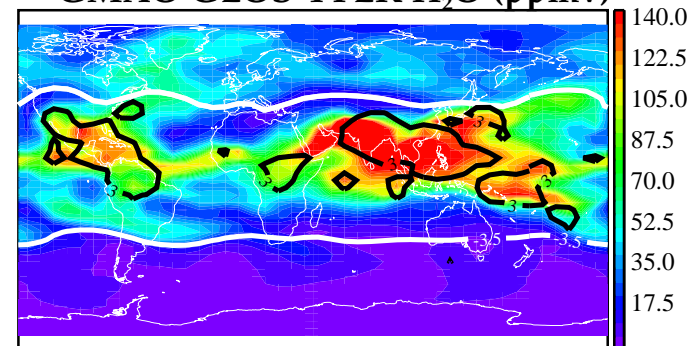
GEOS4-CHEM NRT CO (ppbv)



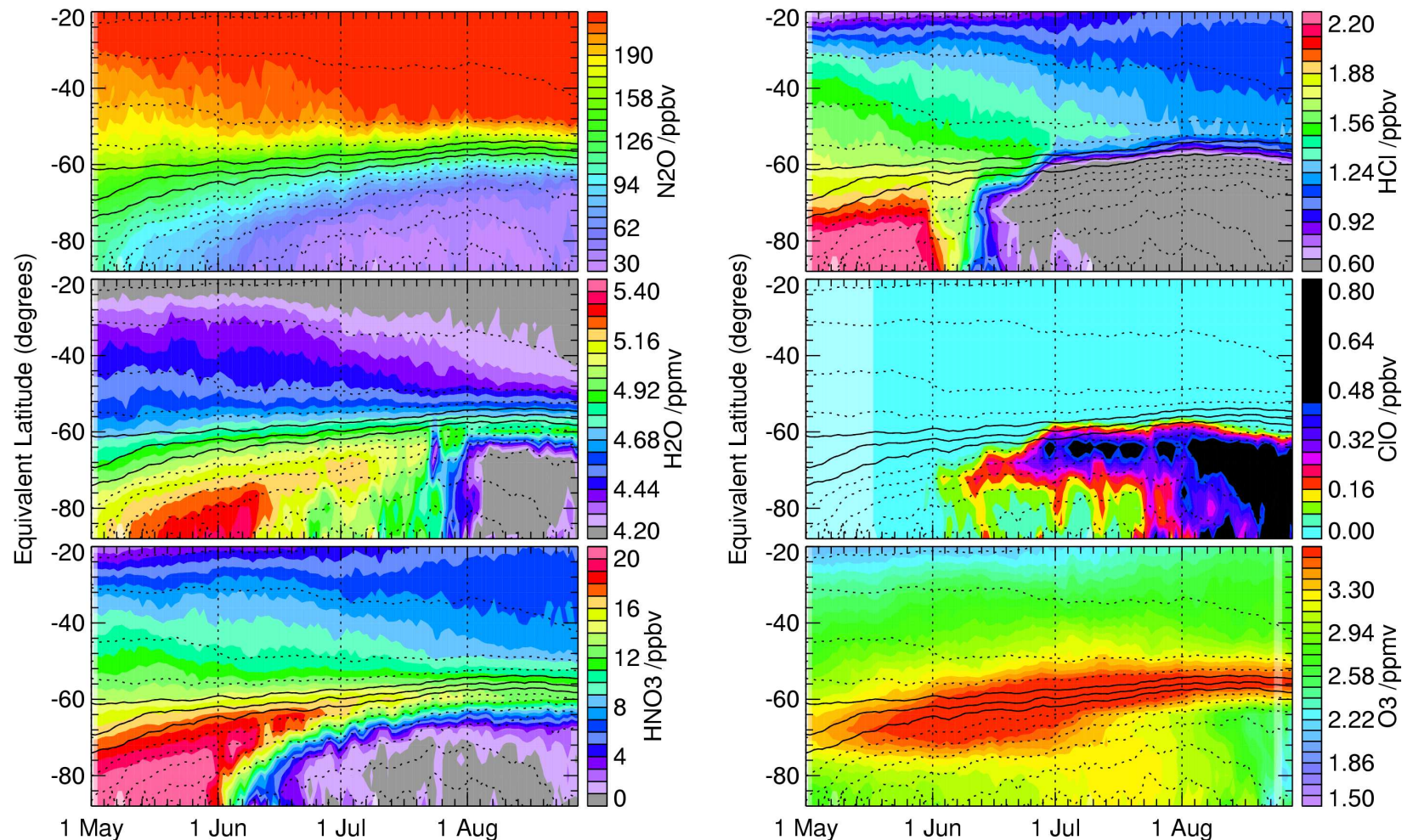
GEOS4-CHEM NRT O₃ (ppbv)



GMAO GEOS-4 FLK H₂O (ppmv)

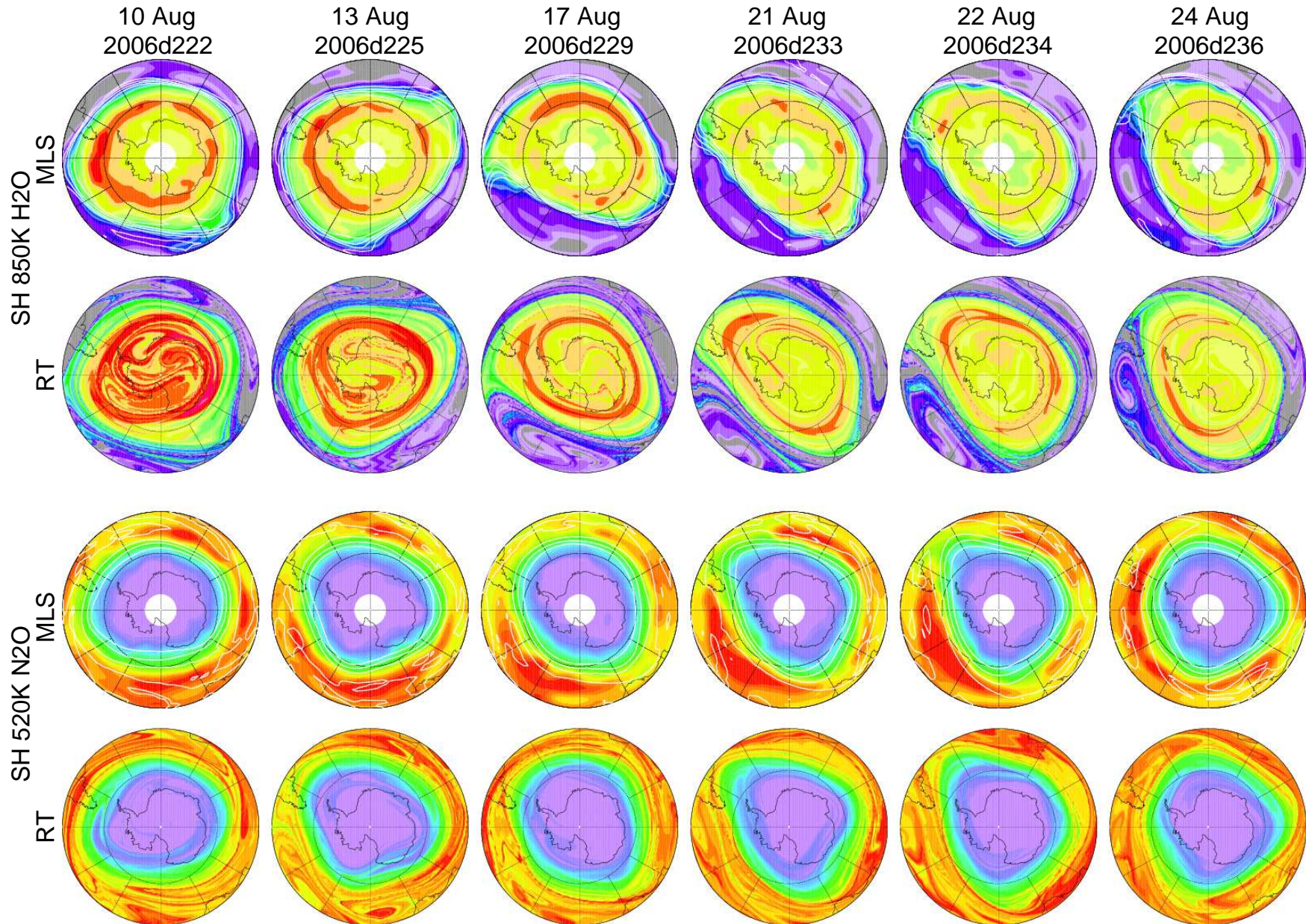


Polar Winter SH Lower Stratosphere



- ☐ EqL-time plots at 520 K in LS, from 1 May 2006 through 30 August 2006, from MLS data and QD-DMPs
- ☐ Vortex size near constant for past ~4 weeks, starting to decrease gradually; N_2O indicates slowing descent near vortex edge, mixing from edge into vortex core (where there is no longer evidence of descent)
- ☐ H_2O and HNO_3 increased in vortex interior, consistent with increased mixing; PSC frequency/coverage may also be decreasing at temperatures rise (much smaller area now where ice PSCs could form than a week or two ago)
- ☐ High ClO , near zero HCl , continue throughout vortex, but ClO receding from vortex edge
- ☐ Rapid O_3 decrease throughout the vortex continues, with very low values appearing near 80EqL

Antarctic Polar Stratosphere – MLS and RT Maps (10–24 August)



- ❑ 520K N₂O and 850K H₂O MLS and 10-day RT maps (problem in making 20 Aug 850 K RT map); LS vortex strong, morphology variable, good agreement of filaments outside the vortex; suggestion of mixing from edge to interior
- ❑ MS vortex continuing to become more active, shrinking slightly; good agreement in filaments outside, better agreement in interior in past week